



west virginia department of environmental protection

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ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Application No.: R13-3187
Plant ID No.: 085-00033
Applicant: Antero Resources Corporation (Antero)
Facility Name: Annie Horizontal Well Pad
Location: near Pennsboro, Ritchie County
NAICS Code: 211111
Application Type: Construction
Received Date: June 19, 2014
Engineer Assigned: Roy F. Kees, P.E.
Fee Amount: \$1,500.00
Date Received: April 30, 2014
Complete Date: July 3, 2014
Due Date: October 3, 2014
Applicant Ad Date: May 7, 2014
Newspaper: *The Herald Record*
UTM's: Easting: 506.429 km Northing: 4,353.115 km Zone: 17
Description: Construction of a natural gas production facility.

DESCRIPTION OF PROCESS

The following process description was taken from Permit Application R13-3187.

A mixture of condensate and entrained gas from the wells enters the facility through a number of low pressure separators where the gas phase is separated from the liquid phase. Heater treaters (H001–H006) are used in conjunction with the separators to help separate the gas from the liquid phases. These heaters are fueled by a slip stream of the separated gas. The separated gas from the low pressure separator is sent to the production unit compressor (E001). The compressed gas is then metered and sent to the sales gas pipeline. The separated condensate and water from the separators flow to their respective storage tanks. (T001-T006 and T007-T008).

The facility has four (6) tanks (T001-T006) on site to store condensate and two (2) tanks (T007-T008) to store produced water prior to removal from the site. Flashing, working and breathing

losses from the tanks are routed to the flare (FL001) to control the emissions. The flare that will be used to control emissions is designed to achieve a VOC destruction efficiency of 98 percent.

Condensate and produced water are transported off site on an as needed basis via tanker truck. Truck loading connections are in place to pump condensate (L001) and produced water (L002) from the storage tanks into tanker trucks. Emissions from the loading operations are vented to the atmosphere.

Emissions from the facility's emission sources were calculated using the extended analysis of the condensate from Central 2H, one of the wells in the Jonathon Davis pad. These extended analyses are considered representative of the materials from Annie Horizontal well pad being in the Marcellus rock formation.

Annie Horizontal Well Pad's calculation of potential to emit include all of the emissions sources that belong to the same industrial grouping, are located on contiguous or adjacent properties, and are under the control of the same person. The nearest emission source that belongs to the same industrial grouping and under the control of the same person but not located on contiguous or adjacent property is the Eddy Pad. This operates independently and is approximately 0.5 miles northeast of the facility.

SITE INSPECTION

A site inspection was conducted by Doug Hammel of the enforcement section on March 5, 2014. "Site is appropriate for R13-3187; Closest residence is ~1600 ft to the NE. Crane on site, but no permit requested construction in progress."

ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

The following indicates which methodology was used in the emissions determination for each proposed piece of processing equipment:

Natural Gas Heaters (H001 - H006):

There are six (6) 1.5 MMBtu/hr (rated) heater treaters installed with the gas production unit to separate the condensate, water and gases. Emissions from the natural gas heaters occur from the combustion of natural gas within the heater treaters. Emissions from the heater treaters were calculated using AP-42, Chapter 1.4 Tables 1.4-1, 1.4-2, 1.4-3 and a heating value of natural gas of 1,203 Btu/scf.

Fugitive Emissions (F001 & PCV):

Fugitive emission calculations were based on component counts at the facility. The potential emissions were estimated using the oil and gas production operations average emission factors in Table 2-4 of the Protocol for Equipment Leak Emission Estimates (EPA-453/R-95-017, November 1995). The composition of the materials in contact with these components was estimated using a sample of the separator liquids and gases. All the pneumatic valves are low bleed valves and each valve has a bleed rate less than 0.275 scf/hour. There are a total of 24 pneumatic valves onsite.

Storage Tanks (T001-T006 & T007-T008):

Storage tank emissions from the six (6) 400 bbl condensate and two (2) 400 bbl produced water, which include flashing, breathing and working losses, were calculated using Promax 3.2 Simulation Software. Flashing emissions for produced water were estimated using 1% from the produced water output from the Promax 3.2 Simulation Software.

Vapor Combustor (FL001):

Condensate and produced water tank emissions are captured and routed to the flare for control. The flare has a control efficiency of 98% for the working, breathing and flashing emissions from the tanks. The flare utilizes an auxiliary pilot to combust the waste gases from the storage tanks. The potential emissions from the combustion of the waste gases include nitrogen dioxide, carbon monoxide and particulate matter, which were calculated using AP-42 section 1.4.

Bulk Liquid Transfer Operations (L001 & L002):

Truck loading operations generate emissions from the displacement of VOCs while loading condensate or produced water. The emissions were calculated using AP-42 Section 5.2-4 and ProMax3.2 Simulation Software. Emissions from each method are similar, so the ProMax3.2 is assumed to be accurate in estimating emissions. Listed below are the parameters used to calculate emissions from the loading operations.

Table 1: Input Parameters for Bulk Liquid Transfer Operations (L001 & L002)

Parameter	Condensate Truck Loading	Produced Water Truck Loading
S (saturation factor)	0.6	0.6
P (true vapor pressure, psia)	2.66	0.22
M (Molecular Weight Vapor)	69	18.02
T (Temperature Bulk Liquid °F)	51	51
Collection Efficiency	0	0
Loading Loss lb/10 ³ gal	2.69	0.06
Maximum Throughput gal/hr	683	8,192
Maximum Throughput gal/yr	5,978,700	71,744,000
Loading Loss tpy	8.0	<0.01

Production Unit Compressor Engine (E001):

The engine was manufactured in 2013. HP ratings were obtained from manufacturer's test results submitted to EPA for Certificated of Conformity. Emission factors used for the 23.6 HP engines NO_x, CO & VOC emissions are the emission standards indicated on EPA's Certificate of Conformity. Emission factors for all other pollutants were obtained from AP-42, Section 3.2. Hours of operation were based on full-time operation (8,760 hrs).

Table 2: Antero Resources Corporation – Annie Horizontal Well Pad (R13-3187) Facility Potential to Emit

Pollutant	Heaters (H001 – H006)		Fugitive Emissions (F001, PCV)		Tank Truck Loading Losses (L001-L002)		Vapor Combustor Operations (FL001)		Production Unit Compressor (E001)		Facility Potential to Emit	
	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
Carbon Monoxide (CO)	0.59	2.60	-	-	-	-	4.06	17.80	5.54	24.30	10.19	44.70
Sulfur Dioxide (SO ₂)	-	0.02	-	-	-	-	-	-	-	-	-	0.02
Oxides of Nitrogen (NO _x)	0.73	3.20	-	-	-	-	0.75	3.30	0.08	0.36	1.55	6.80
Particulate Matter less than 10 microns (PM ₁₀)	0.05	0.24	-	-	-	-	0.09	0.40	-	0.01	0.16	0.70
Particulate Matter less than 2.5 microns (PM _{2.5})	0.05	0.24	-	-	-	-	0.09	0.40	-	0.01	0.16	0.70
Volatile Organic Compounds (VOCs)	0.04	0.17	3.26	14.30	1.82	8.00	5.38	23.60	0.17	0.74	10.67	46.80
Carbon Dioxide Equivalent (CO ₂ e)	868.22	3,808	3.33	14.60	-	-	1,562.71	6,854	28.04	123	2,462.40	10,800
Hazardous Air Pollutants (HAPs)	0.01	0.06	0.22	0.96	0.08	0.36	0.10	0.44	0.01	0.04	0.43	1.90
Benzene	-	-	-	0.01	-	-	-	0.01	-	-	-	0.02
Xylene (mixed)	-	-	-	-	-	-	-	-	-	-	0.05	0.24
Formaldehyde	-	-	-	-	-	-	-	-	-	-	0.01	0.03
Ethylbenzene	-	-	-	-	-	-	-	-	-	-	0.02	0.09
Toluene	-	-	-	-	-	-	-	-	-	-	0.02	0.10
n-Hexane	-	-	-	-	-	-	-	-	-	-	0.32	1.40

REGULATORY APPLICABILITY

The following rules apply to the facility:

45CSR2 (Particulate Air Pollution from Combustion of Fuel in Indirect Heat Exchangers)

The purpose of 45CSR2 (Particulate Air Pollution from Combustion of Fuel in Indirect Heat Exchangers) is to establish emission limitations for smoke and particulate matter which are discharged from fuel burning units.

45CSR2 states that any fuel burning unit that has a heat input under ten (10) million B.T.U.'s per hour is exempt from sections 4 (weight emission standard), 5 (control of fugitive particulate matter), 6 (registration), 8 (testing, monitoring, recordkeeping, reporting) and 9 (startups, shutdowns, malfunctions). However, failure to attain acceptable air quality in parts of some urban areas may require the mandatory control of these sources at a later date.

The individual heat inputs of all of the proposed fuel burning units (H001 - H006) are below 10 MMBTU/hr. Therefore, these units are exempt from the aforementioned sections of 45CSR2. However, Antero would be subject to the opacity requirements in 45CSR2, which is 10% opacity based on a six minute block average. The facility will demonstrate compliance with the rule by conducting Method 9 test at the request of the Director.

45CSR4 (To Prevent and Control the Discharge of Air Pollutants Into the Open Air Which Causes or Contributes to an Objectionable Odor or Odors)

This rule is designed to prevent and control the discharge of pollutants into the open air which causes or contributes to an objectionable odor or odors.

No person shall be considered in violation of this rule unless notified that he is discharging an air pollutant or air pollutants which causes or contributes to an objectionable odor.

45CSR6 (To Prevent and Control Air Pollution from the Combustion of Refuse)

The purpose of this rule is to prevent and control air pollution from combustion of refuse.

Antero has one (1) vapor combustor at the Annie Horizontal Well Pad. The Cimmaron Model 48 HV ECD vapor combustor is subject to section 4, emission standards for incinerators.

Emissions (lb/hr) = F x Incinerator Capacity (tons/hr)

Where, the factor, F, is as indicated in Table I below:

Table I: Factor, F, for Determining Maximum Allowable Particulate Emissions.

Incinerator Capacity	Factor F
A. Less than 15,000 lbs/hr	5.43
B. 15,000 lbs/hr or greater	2.72

Based on the capacity of the incinerator being 90 SCFM and the expected gas composition, the estimated mass flow to the flare will be approximately 501 lb/hr (0.25 ton/year).

Allowable Emissions (lb/hr) = 5.43 x 0.25 tons/hr = 1.4 lb/hr

Hourly particulate matter emissions from the flare are estimated to be 0.09 lb/hr. Therefore, the facility's vapor combustor should demonstrate compliance with this section if the vapor combustor is maintained and operated according to the manufacturer's guidance. The facility will demonstrate compliance by maintaining records of the amount of natural gas consumed by the vapor combustor and the hours of operation. The facility will also monitor the flame of the vapor combustor and record any malfunctions that may cause no flame to be present during operation. Monthly visual emission checks will also be conducted of the vapor combustor.

45CSR13 (Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants, Notification Requirements, Administrative Updates, Temporary Permits, General Permits, and Procedures for Evaluation)

45CSR13 applies to this source due to the fact that Antero is defined as a "stationary source" under 45CSR13 Section 2.24.b, which states that an owner or operator discharges or has the potential to discharge more than six (6) pounds per hour and ten (10) tons per year, or has the potential to discharge more than 144 pounds per calendar day of any regulated air pollutant. Antero's uncontrolled volatile organic compounds (VOC) emissions exceed 45CSR13 permit thresholds. In addition, the facility is proposing to install a flare at the facility, which is subject to a substantive requirement (45CSR6). Antero has published the required Class I legal advertisement notifying the public of their permit application, and paid the appropriate application fee (construction). The Class I legal advertisement was published on May 7, 2014 in *The Ritchie Gazette*.

45CSR16 (Standards of Performance for New Stationary Sources Pursuant to 40 CFR Part 60)

45CSR16 applies to this source because they are subject to 40CFR60 Subpart JJJJ and OOOO.

45CSR22 (Air Quality Management Fee Program)

The Annie Horizontal Facility is not subject to 45CSR30. The facility is subject to 40CFR60 Subpart OOOO, however they are exempt from the obligation to obtain a permit under 40 CFR part 70 or 40 CFR part 71, provided they are not required to obtain a permit for a reason other than their status as an area source, therefore, the facility is not

subject and will pay its annual fees through the Rule 22 program and is classified as a 9M source.

45CSR34 (Emission Standards for Hazardous Air Pollutants)

45CSR34 applies because this source is subject to the area source requirements of 40 CFR 63, Subpart ZZZZ. WVDAQ has taken delegation of the area source requirements of these subparts. 45CSR34 applies to all registrants that are subject to any of the NESHAP requirements.

40CFR60 Subpart JJJJ (Standards of Performance for Stationary Spark Ignition Internal Combustion Engines (SI ICE))

40CFR60 Subpart JJJJ sets forth nitrogen oxides (NO_x), carbon monoxide (CO), and volatile organic compound (VOC) emission limits, fuel requirements, installation requirements, and monitoring requirements based on the year of installation of the subject internal combustion engine.

The proposed engine is a Kubota DG972-SAEH-S1 4SRB.

40CFR§60.4233(d) states that owners of stationary SI ICE with a maximum engine power greater than 19 KW (25 HP) and less than 75 KW (100 HP) must comply with the emission standards for field testing in 40 CFR 1048.101(c) for their non-emergency stationary SI ICE.

The emission standards from 40 CFR 1048.101(c) are HC + NO_x Emission limit = 8.0 g/KW-hr and CO Emission limit = 610 g/KW-hr. The engines are certified engines in accordance with 40 CFR 1048.101. Emissions on the EPA Certificate of Conformity are HC + NO_x Emission limit = 2.7 g/KW-hr and CO Emission limit of 4.4 g/KW-hr. The engines are in compliance with the emission standards set forth in this section.

The facility must demonstrate compliance with 40 CFR§60.4243(b)(1) for certified engines.

The facility must demonstrate compliance with 40 CFR§60.4245(a) for notification, reporting and recordkeeping.

40CFR60 Subpart OOOO (Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution)

40CFR60 Subpart OOOO establishes emission standards and compliance schedules for the control of volatile organic compounds (VOC) and sulfur dioxide (SO₂) emissions from affected facilities that commence construction, modification or reconstruction after August 23, 2011. The following affected sources which commence construction, modification or reconstruction after August 23, 2011 are subject to the applicable provisions of this subpart:

- a. Each gas well affected facility, which is a single natural gas well.

There are three (3) gas wells (API Nos. 047-085-10027, 047-085-10028, 047-085-10029) proposed at the Annie Horizontal Well Pad. The wells were drilled after August 23, 2011. Therefore, these wells are considered affected facilities under this subpart.

The facility is subject to the standards in section §60.5375 and the notification, reporting and recordkeeping requirements of section §60.5420.

- b. Each centrifugal compressor affected facility, which is a single centrifugal compressor using wet seals that is located between the wellhead and the point of custody transfer to the natural gas transmission and storage segment. For the purposes of this subpart, your centrifugal compressor is considered to have commenced construction on the date the compressor is installed (excluding relocation) at the facility. A centrifugal compressor located at a well site, or an adjacent well site and servicing more than one well site, is not an affected facility under this subpart.

There are no centrifugal compressors at the Annie Horizontal Well Pad. Therefore, all requirements regarding centrifugal compressors under 40 CFR 60 Subpart OOOO would not apply.

- c. Each reciprocating compressor affected facility, which is a single reciprocating compressor located between the wellhead and the point of custody transfer to the natural gas transmission and storage segment. For the purposes of this subpart, your reciprocating compressor is considered to have commenced construction on the date the compressor is installed (excluding relocation) at the facility. A reciprocating compressor located at a well site, or an adjacent well site and servicing more than one well site, is not an affected facility under this subpart.

There is one (1) reciprocating compressor at the Annie Horizontal Well Pad. Since, the compressors are located at a well site, the requirements regarding reciprocating compressors under 40 CFR 60 Subpart OOOO would not apply.

- d. Pneumatic Controllers

- Each pneumatic controller affected facility, which is a single continuous bleed natural gas-driven pneumatic controller operating at a natural gas bleed rate greater than 6 scfh which commenced construction after August 23, 2011, and is located between the wellhead and the point of custody transfer to the natural gas transmission and storage segment and not located at a natural gas processing plant.
- Each pneumatic controller affected facility, which is a single continuous bleed natural gas-driven pneumatic controller which commenced construction after August 23, 2011, and is located at a natural gas processing plant.

Each pneumatic controller at the facility has a bleed rate less than 6 scfh. They have a bleed rate of 0.275 scf/hr/pneumatic controller. Therefore, there are no applicable requirements regarding pneumatic controllers under 40 CFR 60 Subpart OOOO that would apply.

- e. Each storage vessel affected facility, which is a single storage vessel, located in the oil and natural gas production segment, natural gas processing segment or natural gas transmission and storage segment.

40CFR60 Subpart OOOO defines a storage vessel as a unit that is constructed primarily of nonearthen materials (such as wood, concrete, steel, fiberglass, or plastic) which provides structural support and is designed to contain an accumulation of liquids or other materials. The following are not considered storage vessels:

- Vessels that are skid-mounted or permanently attached to something that is mobile (such as trucks, railcars, barges or ships), and are intended to be located at a site for less than 180 consecutive days. If the source does not keep or are not able to produce records, as required by §60.5420(c)(5)(iv), showing that the vessel has been located at a site for less than 180 consecutive days, the vessel described herein is considered to be a storage vessel since the original vessel was first located at the site.
- Process vessels such as surge control vessels, bottoms receivers or knockout vessels.
- Pressure vessels designed to operate in excess of 204.9 kilopascals and without emissions to the atmosphere.

This rule requires that the permittee determine the VOC emission rate for each storage vessel affected facility utilizing a generally accepted model or calculation methodology within 30 days of startup, and minimize emissions to the extent practicable during the 30 day period using good engineering practices. For each storage vessel affected facility that emits more than 6 tpy of VOC, the permittee must reduce VOC emissions by 95% or greater within 60 days of startup. The compliance date for applicable storage vessels is October 15, 2013.

The storage vessels at the facility were constructed after August 23, 2011. The facility is considered to have Group 2 Storage Vessels. The facility has determined the potential emissions from the storage tanks and the uncontrolled emissions are greater than 6 tpy. The storage vessels located at the Annie Horizontal Well Pad are controlled by an enclosed flare. The flare will have 98% control efficiency. Therefore, Antero is not required by this section to further reduce VOC emissions by 95%, since this subpart will take into account federal enforceable controls in Permit R13-3187. Controlled emissions from the flare are 23.60 tpy VOCs. Divided equally between the condensate tanks, the VOC emissions from each tank is ~ 3.9 tpy VOC.

- f. The group of all equipment, except compressors, within a process unit is an affected facility.
- Addition or replacement of equipment for the purpose of process improvement that is accomplished without a capital expenditure shall not by itself be considered a modification under this subpart.
 - Equipment associated with a compressor station, dehydration unit, sweetening unit, underground storage vessel, field gas gathering system, or liquefied natural gas unit is covered by §§60.5400, 60.5401, 60.5402, 60.5421 and 60.5422 of this subpart if it is located at an onshore natural gas processing plant. Equipment not located at the onshore natural gas processing plant site is exempt from the provisions of §§60.5400, 60.5401, 60.5402, 60.5421 and 60.5422 of this subpart.
 - The equipment within a process unit of an affected facility located at onshore natural gas processing plants and described in paragraph (f) of this section are exempt from this subpart if they are subject to and controlled according to subparts VVa, GGG or GGGa of this part.

The Annie Horizontal Well Pad is not a natural gas processing plant. Therefore, Leak Detection and Repair (LDAR) requirements for onshore natural gas processing plants would not apply.

- g. Sweetening units located at onshore natural gas processing plants that process natural gas produced from either onshore or offshore wells.
- Each sweetening unit that processes natural gas is an affected facility; and
 - Each sweetening unit that processes natural gas followed by a sulfur recovery unit is an affected facility.
 - Facilities that have a design capacity less than 2 long tons per day (LT/D) of hydrogen sulfide (H₂S) in the acid gas (expressed as sulfur) are required to comply with recordkeeping and reporting requirements specified in §60.5423(c) but are not required to comply with §§60.5405 through 60.5407 and paragraphs 60.5410(g) and 60.5415(g) of this subpart.
 - Sweetening facilities producing acid gas that is completely reinjected into oil-or-gas-bearing geologic strata or that is otherwise not released to the atmosphere are not subject to §§60.5405 through 60.5407, 60.5410(g), 60.5415(g), and 60.5423 of this subpart.

There are no sweetening units at the Annie Horizontal Well Pad. Therefore, all requirements regarding sweetening units under 40 CFR 60 Subpart OOOO would not apply.

The following rules and regulations do not apply.

45CSR10 (To Prevent and Control Air Pollution from the Emissions of Sulfur Oxides) (*Non-Applicable*)

45CSR10 states that any fuel burning unit that has a heat input under ten (10) million B.T.U.'s per hour is exempt from sections 3 (weight emission standard), 6 (registration), 7 (permits), and 8 (testing, monitoring, recordkeeping, reporting). However, failure to attain acceptable air quality in parts of some urban areas may require the mandatory control of these sources at a later date.

The individual heat inputs of all of the proposed fuel burning units (H001 - H006) are below 10 MMBTU/hr. Therefore, these units are exempt from the aforementioned sections of 45CSR10.

40CFR60 Subpart 60.18 (General Control Device and Work Practice Requirements) (*Non-Applicable*)

40CFR60 Subpart 60.18 contains requirements for control devices when they are used to comply with applicable subparts of 40CFR60 and 40CFR61. Antero's Annie Horizontal Well Pad has a proposed enclosed vapor combustor, a Cimarron 48" HV ECD. The purpose to the vapor combustor is to control emissions from the tanks that are routed to it. In addition, 40CFR60 Subpart 60.18 refers to flares, but does mention enclosed vapor combustors. EPA doesn't consider vapor combustors to meet the design specification, i.e. configuration, for 40CFR60 Subpart 60.18.

40CFR60 Subpart Kb (Standards of Performance for VOC Liquid Storage Vessels) (*Non-Applicable*)

40CFR60 Subpart Kb does not apply to storage vessels with a capacity less than 75 cubic meters (19,812.9 gallons). The condensate and produced water tanks that Antero has proposed to install are 16,800 gallons each (400 bbls). Therefore, Antero would not be subject to this rule.

40CFR60 Subpart KKK (Standards of Performance for Equipment Leaks of VOC from Onshore Natural Gas Processing Plants) (*Non-Applicable*)

40CFR60 Subpart KKK applies to onshore natural gas processing plants that commenced construction after January 20, 1984, and on or Before August 23, 2011. The Annie Horizontal Well Pad was constructed after August 23, 2011 and is not a natural gas processing plant, therefore, Antero would not be subject to this rule. Also, 40CFR60 Subpart OOOO has replaced this regulation.

45CSR14 (Permits for Construction and Major Modification of Major Stationary Sources of Air Pollutants) (*Non-Applicable*)

45CSR19 (Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution which Cause or Contribute to Nonattainment) (*Non-Applicable*)

The Annie Horizontal Well Pad is located in Ritchie County which is an attainment county for all pollutants.

As shown in the table below, Antero is not subject to 45CSR14 or 45CSR19 review.

Table 3: PSD & NANSR Applicability

Pollutant	PSD (45CSR14) Threshold (tpy)	NANSR (45CSR19) Threshold (tpy)	Annie Horizontal Well Pad PTE (tpy)	45CSR14 or 45CSR19 Review Required?
Carbon Monoxide	250	NA	44.70	No
Nitrogen Oxides	250	NA	6.80	No
Sulfur Dioxide	250	NA	0.02	No
Particulate Matter 2.5	250	NA	0.70	No
Ozone (VOC)	250	NA	46.80	No
Greenhouse Gas (CO ₂ e)	100,000	NA	10,800	No

45CSR30 (Requirements for Operating Permits) (*Non-Applicable*)

This rule provides for the establishment of a comprehensive air quality permitting system consistent with the requirements of Title V of the Clean Air Act. All fees collected pursuant to this rule shall be expended solely to cover all reasonable direct and indirect costs required to administer the Title V operating permit program and accounted for in accordance with this rule.

TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

There will be small amounts of various non-criteria regulated pollutants emitted from the combustion of natural gas. Criteria pollutants are defined as Carbon Monoxide (CO), Lead (Pb), Oxides of Nitrogen (NO_x), Ozone, Particulate Matter (PM), Particulate Matter less than 10 microns (PM₁₀), Particulate Matter less than 2.5 microns (PM_{2.5}), and Sulfur Dioxide (SO₂). These pollutants have National Ambient Air Quality Standards (NAAQs) set forth for each that are designed to protect the public health and welfare. Other pollutants of concern, although designated as non-criteria and without national concentration standards, are regulated through various federal programs designed to limit their emissions and public exposure. These programs include federal source-specific Hazardous Air Pollutants (HAPs) standards promulgated under 40 CFR 61 (NESHAPs – National Emission Standards for Hazardous Air Pollutants) and 40 CFR 63 (MACT – Maximum Available Control Technology). Any potential applicability to these programs was discussed above in the Regulatory Applicability section.

There are trace amounts of the non-criteria pollutants emitted by Antero's Annie Horizontal Well Pad fall under the definition of Hazardous Air Pollutants (HAPs). HAPs are identified under Section 112 (b) of the Clean Air Act (CAA) as pollutants or groups of pollutants that EPA knows or suspects may cause cancer or other serious human health effects. The following HAPs listed below are HAPs that are emitted from the Annie Horizontal Well Pad in quantifiable amounts (≥ 0.01 tpy). This table describes the individual HAP's carcinogenic risk as listed in the Integrated Risk Information System (IRIS), which is maintained and updated by EPA.

Table 5: Annie Horizontal Pad HAPs and Carcinogenic Risk

HAPs	Type	Known/Suspected Carcinogen	Classification
<i>n-Hexane</i>	VOC	No	Inadequate Data
<i>Benzene</i>	VOC	Yes	Category A - Known Human Carcinogen
<i>Toluene</i>	VOC	No	Inadequate Data
<i>Xylenes</i>	VOC	No	Inadequate Data
<i>Ethylbenzene</i>	VOC	No	Classification D – Not Classifiable as a Human Carcinogen
<i>Formaldehyde</i>	VOC	Yes	Category B1; Probable Human Carcinogen

AIR QUALITY IMPACT ANALYSIS

Modeling was not required of this source due to the fact that the facility is not subject to 45CSR14 (Permits for Construction and Major Modification of Major Stationary Sources of Air Pollutants) as seen in the table listed in the Regulatory Discussion Section.

MONITORING OF OPERATIONS

Antero will be required to perform the following monitoring associated with this permit application:

1. Monitor and record quantity of natural gas consumed for all combustion sources and engines.
2. Monitor the presence of the pilot flame with a thermocouple or equivalent.
3. Monitor opacity from all fuel burning units.
4. Monitor the tanks to ensure that all vapors are sent to the vapor combustor or vapor recovery units.
5. Monitor the amount of condensate and produced water produced (throughput to tanks).
6. Monitor the truck loadout throughput of condensate and produced water.

RECOMMENDATION TO DIRECTOR

The information provided in the permit application indicates Antero's Annie Horizontal Well Pad should meet all the requirements of applicable regulations. Therefore, impact on the surrounding area should be minimized and it is recommended that this location should be granted a 45CSR13 construction permit for this proposed permitting action.

Roy F. Kees, P.E.
Engineer – NSR Permitting

Date